Features

- 2 independent delay channels (or 4 or 8 in option)
- 100 ps delay resolution (1ps in option)
- 25 ps channel to channel RMS jitter (5 ps in option)
- Output pulse 1.5 to 5 V / 50 Ω, 2 ns rise time with variable control of width, polarity, amplitude, and MUX mode
- Independent trigger rate (repetitive, single or burst) for every channel
- External trigger from two inputs (one with pre-scaler) or internal trigger mode from two synchronous programmable timers and soft command.
- Gate (or second trigger) input
- External clocking up to 240 MHz (user programmable)
- Controlled via USB and Ethernet (WiFi + Bluetooth in option)
- Ultra-compact packaging and low power
- External AC/DC compact power supply
- Channel output amplitude option: 3 to 10 V or 15 to 50 V or LVDS level

Applications

- Laser Pulse Piking
- ATE Application
- System Laser Timing Control
- Precision Pulse Application
- Instrument Triggering
- Components Test

Description

The GFT1804 Pulse & Delay Generator provides 2 (or 4 or 8 in option) independent delayed pulses. Delays up to 10 seconds can be programmed with 100 ps resolution and channel to channel jitter less than 25 ps RMS. An option allows to enhance delay resolution to 1 ps, and channel to channel jitter to 5 ps RMS.

SMB outputs deliver 1.5 V to 5 V, 2 ns rise time pulses, under 50 Ω. Pulse amplitude, polarity and width are adjustable on each output channel. In option, pulse amplitude can be 3 V to 10 V or 15 V to 50 V under 50 Ω or LVDS level.

The model GFT1804 offer two inputs or two internal synchronized timers (adjustable from 0.1 Hz to 50 MHz) or software command for triggering all selected delay channel. The internal timers may be started by pushbutton or software command. Either trigger rate may be set as one-shot or repetitive.

The generator uses an internal 100 MHz TCXO clock reference, or an external user programmable (from 10 MHz to 240 MHz) clock (sine or square).

GFT1804 parameters can be remote controlled via Ethernet or USB to UART (or WiFi / Bluetooth in option).

Application example: The GFT1804 is well suited to synchronize all the devices of a Picosecond Laser system with only one compact unit and one GUI. In this application the “Clock reference input” of the pulse and delay generator receives a signal (80 MHz for example) from laser oscillator via an O/E (optical to electrical converter). From the GFT1804 Generator each amplifier (Pump-laser, Q-switch, Pockel cell ...) or diagnostic instruments (Digitizer, Calorimeter, CCD camera ...) can receive repetitive or single pulses (adjusted in rate, delay, amplitude, polarity and width) synchronized on “Clock reference input” with a very low jitter. From generator 4 Input and output GPIO under software control allow command for security or control to low frequency device.
### Specifications

#### Delay channels
- **Number**: 2 independents (or 4 or 8 in option)
- **Range**: 10 seconds
- **Resolution**: 100 ps (1ps in option)
- **RMS jitter**: < 25 ps + delay x 10^-7, channel to channel (< 5 ps + delay x 10^-7 in option)
- **Accuracy**: < 500 ps + delay x 10^-7
- **Trigger delay**: < 50 ns (insertion delay)
- **Time base**: Internal 200 MHz, ±5 ppm stability

#### External Trigger Mode
- **Input “TRIG”**: Rate single or repetitive up to 50 MHz, with prescaler, adjustable threshold, positive slope

#### Internal Trigger Mode
- **Rate repetitive**: From two Timers with frequency = 0.1 Hz to 50 MHz (in step of 5 ns)
- **Rate single trigger**: From "Trigger input" or Soft Command

#### Channel Output pulse T1 to T2 (and T3 to T8)
- **Amplitude**: 1.5 V to 5 V in step of 10 mV
- **Load**: 50 Ω
- **Rise/Fall Time**: 2 ns / 3 ns
- **Width**: 10 ns to 1 s in step of 5 ns
- **Pulse Polarity**: Positive or Negative
- **Burst Mode**: From 1 to 65535, adjustable period
- **MUX Mode**: Any channel may be OR' to all outputs

#### External Clock reference
- **Threshold**: 0 V, internal 50 Ω
- **Level / shape**: Min 0 dBm, typical 6 dBm / Sine or square
- **Frequency**: 10 MHz to 240 MHz, user programmable in steps of 0.25 MHz (0.5 MHz from 120 MHz to 240 MHz)

#### Clock output
- **Level /shape**: 0 to 3 V under 50 Ω, Square
- **Frequency**: 10 MHz to 240 MHz

#### Gate
- **Input**: Active high, adjustable threshold, positive slope, rate < 10 MHz
- **Function**: Gate or second External Trigger

#### GPIO
- **4 x GPIO**: Input or output, 0 or 3 V level, SMH-103-02-D Samtec connector

#### General
- **Interface Control**: USB to UART, Ethernet 10/100 Mb/s, WiFi / Bluetooth in option
- **Software tools**: Free Drivers for Windows 7/10, Linux
- **Power consumption**: 2.5 W to 15 W according to configuration
- **Power supply**: USB or External AC (80 - 264 V/47–63 Hz) to DC (5 V / 4 A)
- **Size / Weight**: 100 x 20 x 150 mm / <1 kg

#### Options
- **Option 1**: Extension to 4 channels
- **Option 2**: Extension to 8 channels
- **Option 3**: 1 ps delay resolution, channel to channel jitter < 5 ps, and min width of 5 ns
- **Option 4**: (bank of 2 channels) 3 V to 10 V channel output, width= 10 ns to 10 ms, rise/fall time = 2/3 ns typ. under 50 Ω
- **Option 5**: (bank of 2 channels) 15 V to 50 V channel output, width = 50 ns to 10 μs, rise/fall time = 3/15 ns under 50 Ω
- **Option 6**: (bank of 2 channels) LVDS outputs 400 mV to 800 mV, min width = 5 ns (or 1 ns, with option 2) to 1 s, rise/fall time = 500/500 ps under 50 Ω (available in Q4 2019)
- **Option 7**: (bank of 2 channels) pulse output replaced by one clock output (LVDS, 1 GHz max.)
- **Option 8**: WiFi + Bluetooth (available in Q4 2019)
- **Option 9**: 5 x 3’ SMB to BNC cable
Operating Information

Block diagram of the generator

**Time base**: This function provides a 200 MHz time base from an internal reference or an external 10 MHz to 240 MHz reference.

**Trigger controller**: This function provides 2 Trigger Modes,
- **External Trigger Mode**: In this mode, a rising edge on "Trigger Input", or "gate input", triggers all selected delay channel. On every channel trigger rate can be single or repetitive or inhibited.
- **Internal Trigger Mode**: In this mode, delay channels can be triggered from 2 frequency programmable synchronized Timers or command. On every channel trigger rate can be single or repetitive or burst or inhibited.

"Gate Input" allows to inhibit quickly all selected channel Outputs. This input function can be selected as a second External Trigger.

<table>
<thead>
<tr>
<th>Trigger sources</th>
<th>External mode</th>
<th>Gate</th>
<th>Timer N°1</th>
<th>Timer N°2</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Delay Channel**: They are 2 independent delay channels (or 4 or 8 in option). The delay from selected trigger source is programmable up to 10 seconds in 100 ps increments (1 ps in option).

**Channel Output**

Each delayed output pulse (T1 to T2 or T3 to T8) can be independently adjustable in level (1.5 V to 5 V in 10 mV steps), width (10 ns to 1 s in 5 ns steps), and polarity, and may be OR’ed to all other outputs. The outputs are designed to drive 50 Ω load.

In option every channel output level can be 3 V to 10 V or 15 V to 50 V or under LVDS standard (ask to the factory for mixed channel output level configuration in bank of 2 channels).

**Interface Controller**: Manages internal functions and user interface. All the parameters can be remote controlled via USB to UART and Ethernet (10/100 Mb/s). A Bluetooth (v4.1) or WiFi (802.11b/g/n) interface is available in option. All parameters values are automatically saved.

GPIO under software command allows to control other devices.

**Example of channel output mode**

- **Channel T1** (Repetitive)
- **Channel T2** (Repetitive)
- **Channel T3** (Single)
- **Channel T4** (Burst = 2)
- **Channel T5** (Mux = T2+T4)
Input & Output

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**Connectors**

<table>
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<th></th>
<th>Description</th>
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<td>1</td>
<td>Trigger input: SMB connector</td>
</tr>
<tr>
<td>2</td>
<td>T1 channel output: SMB connector</td>
</tr>
<tr>
<td>3</td>
<td>T2 channel output: SMB connector</td>
</tr>
<tr>
<td>4</td>
<td>T3 channel output: SMB connector</td>
</tr>
<tr>
<td>5</td>
<td>T4 channel output: SMB connector</td>
</tr>
<tr>
<td>7</td>
<td>Gate: SMB connector</td>
</tr>
<tr>
<td>8</td>
<td>External Clock: SMB connector</td>
</tr>
<tr>
<td>9</td>
<td>Clock output: SMB connector</td>
</tr>
<tr>
<td>A</td>
<td>USB: micro AB</td>
</tr>
<tr>
<td>B</td>
<td>LAN: RJ45 connector (B-Top)</td>
</tr>
<tr>
<td>C</td>
<td>+5 V power: Jack 2.10 mm</td>
</tr>
</tbody>
</table>

**Switch**

6 ON/OFF and RUN/STOP Trigger

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**Ordering information**

**Generator part number:**
GFT1804-X-X-X-X (Where “X” is option number)

**Ordering example**
GFT1804-1-4 (GFT1804 with extension to 4 channels and 3 V to 10 V channel outputs)

**Accessories** (Modules to provide specific output pulse shape)

<table>
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<tr>
<th>Model</th>
<th>Description</th>
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<td>GFT101</td>
<td>Electrical to optical Pulse Converter</td>
</tr>
<tr>
<td>GFT300</td>
<td>Sub nanosecond Pulse Stretcher</td>
</tr>
<tr>
<td>GFT400</td>
<td>500 ps (FMHM) width, 2 V under 50 Ω, Gaussian Pulse Generator</td>
</tr>
<tr>
<td>GFT500</td>
<td>200 ps rise time, 5 V amplitude under 50 Ω, Step Generator</td>
</tr>
<tr>
<td>GFT632</td>
<td>2 ns rise time, 15 to 70 V amplitude, Pulse Generator</td>
</tr>
</tbody>
</table>